NPL-027-2-11-R8

HRS DOCUMENTATION RECORD--REVIEW COVER SHEET

SDMS Document ID
2002696

Name of Site: Vasquez Boulevard and I-70

Contact Persons

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Pathways, Components, or Threats Not Scored

Groundwater Migration Pathway

Individuals inhabiting an area within four miles of the Vasquez and I-70 study area receive most of their drinking water from municipal sources and not from localized groundwater aquifers. The effects of the surficial soil contamination on area groundwater was not evaluated. Based on the lack of data and a limited number of targets, the Groundwater pathway will not be scored as part of this HRS package.

Surface Water Migration Pathway

The extent of surficial soil contamination encompasses an area of approximately 456 acres. The most prominent surface water feature subject to site contamination in this area is the South Platte River; however, the River is located approximately 2,000 feet west of the area of documented soil contamination and there were no identified drinking water intakes along the 15-mile target distance limit. To date, the likelihood of site contaminants migrating from the Vasquez and I-70 area to fisheries and wetlands associated with the South Platte River has not been evaluated. The Surface Water pathway will not be scored as part of this HRS package.

Air Migration Pathway

There are insufficient data to satisfy HRS requirements for establishing an observed release of arsenic to the air in the Vasquez and I-70 study area. Without an observed release, only potential to release may be evaluated for this pathway, and this minimally impacts the overall site score. As such, the Air Migration pathway will not be scored as part of this HRS package.

HRS DOCUMENTATION RECORD

Name of Site: Vasquez Boulevard and I-70

EPA Region: VIII

Date Prepared: 1/7/99

Street Address of Site: NA

County and State: Adams and Denver Counties, Colorado

General Location in the State: The Vasquez Boulevard and I-70 site encompasses an area situated in the Northern and Central portion of the City and County of Denver, and extending north into Adams County, Colorado. Denver, Colorado, is located in the central portion of Colorado along the Front Range of the Rocky Mountains.

Topographic Map: USGS 7.5' Topographic Map, Commerce City, CO Quadrangle.

Latitude: 39^0 47' 30" N

Longitude: 104^0 57' 30" W

The Vasquez Boulevard and I-70 site consists of surface soils present in the parks, schools, and residences in the Elyria and Swansea neighborhoods in North Denver, Colorado. Street boundaries for the area are Colorado Boulevard on the east, the South Platte River on the west, East 38th Avenue on the south, and East 56th Avenue on the north, although ongoing studies may further increase the site boundaries (Refs. 3, Figure 1; 4; 14).

Three major smelters have operated in the North Denver area over the years: Asarco, the Argo, and the Omaha & Grant. Of these, the Omaha & Grant smelter was the nearest, located immediately to the west of the study area (Ref. 5, pp. 2-3, Figure 1). Construction on the Grant smelter was begun July 1882 and by November of that year was in full production on 50 acres east of the South Platte River and south of the present Denver Coliseum (Ref. 5, pp. 2-3, Figure 1; 17, pp. 142-148, 154-155; 18, p.38). At the time of its building, the Omaha & Grant Smelter was considered "...the largest and one of the most complete establishments for the treatment of ores in the world." (Ref. 18, p. 38). Omaha & Grant used a 352 foot high stack with nine water jacket blast furnaces below to handle a daily capacity of up to 300 tons of ore (Ref. 18, p.38). From its opening in 1882 until the smelter closed in 1902, copper, gold, lead, silver and zinc ores were smelted or refined onsite, although the bulk of Omaha & Grant's operations appear to have been in lead smelting (Refs. 17, pp. 142-148, 154-155; 19, pp. 2, 3). In all smelting processes, it is not possible to completely separate the desired metal from the dross, and a portion is lost in the slag, in the flue dust, and some is lost in the exhaust gases (Ref. 20, p. 92). Some of the major impurities in lead smelting are gold, silver, copper, arsenic and zinc (Ref. 20, p. 314). Smelter emissions from the Omaha & Grant stack likely transported contaminants into the atmosphere until they cooled and fell out onto the surrounding neighborhoods (Ref. 5, pp. 3-4).

Scores

Air Pathway	0.00
Groundwater Pathway	0.00
Soil Exposure Pathway	100.00
Surface Water Pathway	0.00
HRS SITE SCORE	**50.00**

WORKSHEET FOR COMPUTING HRS SITE SCORE

		S	S^2
1.	Groundwater Migration Pathway Score (S_{gw}) (from Table 3-1, line 13)	NS	___
2a.	Surface Water Overland/Flood Migration Component (from Table 4-1, line 30)	NS	___
2b.	Groundwater to Surface Water Migration Component (from Table 4-25, line 28)	NS	___
2c.	Surface Water Migration Pathway Score (S_{sw}) Enter the larger of lines 2a and 2b as the pathway score.	NS	___
3.	Soil Exposure Pathway Score (S_s) (from Table 5-1, line 22)	100	10,000
4.	Air Migration Pathway Score (S_a) (from Table 6-1, line 12)	NS	___
5.	Total of $S_{gw}^2 + S_{sw}^2 + S_s^2 + S_a^2$		10,000
6.	**HRS Site Score** Divide the value on line 5 by 4 and take the square root	**50.00**	

TABLE 5-1
SOIL EXPOSURE PATHWAY SCORE SHEET

	Factor Categories and Factors	Maximum Value	Value Assigned
	RESIDENT POPULATION THREAT		
	Likelihood of Exposure		
1.	Likelihood of Exposure	550	550
	Waste Characteristics		
2.	Toxicity	a	10,000
3.	Hazardous Waste Quantity	a	100
4.	Waste Characteristics	100	32
	Targets		
5.	Resident Individual	50	50
6.	Resident Population		
	6a. Level I Concentrations	b	2062
	6b. Level II Concentrations	b	1658
	6c. Resident Population (lines 6a + 6b)	b	3720
7.	Workers	15	0
8.	Resources	5	0
9.	Terrestrial Sensitive Environments	c	0
10.	Targets (lines 5 + 6c + 7 + 8 + 9)	b	3770
	Resident Population Threat Score		
11.	Resident Population Threat (lines 1 x 4 x 10)	b	66,352,000

a Maximum value applies to waste characteristics category.
b Maximum value not applicable.
c No specific maximum value applies to factor. However, pathway score based solely on terrestrial sensitive environments is limited to maximum to 60.
d Do not round to nearest integer.

TABLE 5-1
SOIL EXPOSURE PATHWAY SCORE SHEET
(continued)

	Factor Categories and Factors	Maximum Value	Value Assigned
	NEARBY POPULATION THREAT		
	Likelihood of Exposure		
12.	Attractiveness/Accessibility	100	0
13.	Area of Contamination	100	0
14.	Likelihood of Exposure	500	NS
	Waste Characteristics		
15.	Toxicity	a	0
16.	Hazardous Waste Quantity	a	0
17.	Waste Characteristics	100	NS
	Targets		
18.	Nearby Individual	1	0
19.	Population Within 1 Mile	b	0
20.	Targets (lines 18 + 19)	b	NS
	Nearby Population Threat Score		
21.	Nearby Population Threat (lines 14 x 17 x 20)	b	NS
	SOIL EXPOSURE PATHWAY SCORE		
	Soil Exposure Pathway Score[d]		
22.	(S_s), (lines [11 + 21] ÷ 82,500 subject to a maximum of 100)	100	100

a Maximum value applies to waste characteristics category.
b Maximum value not applicable.
c No specific maximum value applies to factor. However, pathway score based solely on terrestrial sensitive environments is limited to maximum to 60.
d Do not round to nearest integer.

REFERENCES

Reference Number	Description of the Reference
1	Office of the Federal Register National Archives and Records Administration (OFRNARA), December 14, 1990, 40 CFR Part 300, Hazard Ranking System (HRS) for Uncontrolled Hazardous Substance Releases.
2	Superfund Chemical Database Matrix, Hazardous Substance Reference Table, September 1996.
3	URS Operating Services, Inc. 1998, Sampling and Analysis Report for the Removal Site Assessment, Vasquez Boulevard and I-70 Residential Soils TDD 9712-0003. 168 pages.
4	ISSI 1998, GIS Map depicting Areas of observed Arsenic Contamination based on laboratory analytical results for the Vasquez Boulevard and I-70 Soils Residential Soils Investigation. One sheet.
5	Fonda A. Apostolopoulos, Colorado Department of Public Health and Environment. Comprehensive Analytical Results Report, Omaha & Grant Smelter Site, Denver Colorado, August 28, 1998. 10 Pages.
6	URS Operating Services, June 19, 1998 Appendix B, Laboratory Data and Validation Reports, Confirmation samples submitted by UOS for the Vasquez and I-70 Residential Soil Investigation. 460 Pages.
7	Shacklette, Hansford T., and Boerngen, Josephine G., 1984. Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States. United States Geological Survey Professional Paper 1270. 105 Pages.
8	TRC Environmental Consultants, September 20, 1988, Remedial Investigation Report, Globe Plant Site, Vol. II Appendices, Denver, Colorado TRC Project No. 3558-N2. 224 pages, excerpt.
9	TRC Environmental Consultants, September 20, 1988, Remedial Investigation Report, Globe Plant Site, Denver, Colorado TRC Project No. 3558-N2. 172 pages, excerpt.
10	United States Department of Commerce, Bureau of Census, 1990, Census of Population and Housing, Summary Population and Housing Characteristics, Colorado. 104 Pages.
11	URS Operating Services, Inc., July 1998, Sample Quantitation Limit Calculations for Soil Samples collected during the I-70 and Vasquez Boulevard Residential Soil Investigation. 28 Pages.
12	URS Operating Services, Inc. July 1998, Documentation Log Book for the Preparation of the Vasquez Boulevard and I-70 HRS Documentation Record. 14 Pages.
13	URS Operating Services, Inc., June 19, 1998. Appendix D, Field Data Sheets for the Vasquez Boulevard and I-70 Residential Soils Investigation, Denver, Colorado. 242 Pages.
14	U.S. Geological Survey (USGS) 1965, 7.5 Minute Quadrangle map. Commerce City, Colorado. Revised 1994. 1 Sheet.

15 Edith Eudora Kohl. Denver Post, Sunday, February 26, 1950. Newspaper Article Entitled "Giant Stack Marked Denver As Smelting Center of World". 2 pages.

16 URS Operating Services, April, 1998, Sample Identification Key Entitled "Vasquez Boulevard/I-70 Site Soil Sample Identification". 1 Page.

17 Fell, J., 1944. Ores To Metals; The Rocky Mountain Smelting Industry. University of Nebraska Press, Omaha, Nebraska. 311 Pages.

18 Colorado Mining Directory. Colorado Mining Directory Company, 1883. 908 Pages.

19 Robert C. Whitcomb. Colorado School of Mines, 1952. Research Paper Entitled "History of the Grant Smelter and Stack". Best Paper Award. 8 Pages.

20 Stoughton, B., and Butts, A., 1926. Engineering Metallurgy, A Textbook For Users Of Metals. McGraw-Hill Book Company, New York, New York. 441 Pages.

21 Office of Solid Waste and Emergency Response (OSWER), November, 1996, Directive 9285.7-14FS, Using Qualified Data To Document An Observed Release. 18 Pages.

22 Austin N. Buckingham, Colorado Department of Public Health and Environment. Preliminary Assessment, Omaha & Grant Smelter Site, Denver Colorado, February 27, 1992. 16 Pages.

SOURCE DESCRIPTION

2.2 Source Characterization

Number of the source: 1

Name and description of the source: Contaminated surface soils.

Three major smelters have operated in the North Denver area over the years: Asarco or Globe, the Argo, and the Omaha & Grant. Of these, the Omaha & Grant smelter was the nearest, located immediately to the west of the study area (Ref. 5, pp. 2-3, Figure 1). Construction on the Grant smelter was begun July 1882 and by November of that year was in full production on 50 acres east of the South Platte River and south of the present Denver Coliseum (Ref. 5, pp. 2-3, Figure 1; 17, pp. 142-148, 154-155; 18, p.38). At the time of its building, the Omaha & Grant Smelter was considered "...the largest and one of the most complete establishments for the treatment of ores in the world." (Ref. 18, p.38). Omaha & Grant used a 352 foot high stack, the tallest in the United States at the time, with nine water jacket blast furnaces below to handle a daily capacity of up to 300 tons of ore (Refs. 18, p.38; 19, p. 1). From its opening in 1882 until the smelter closed in 1902, ores were smelted or refined onsite to extract copper, gold, lead, silver and zinc, although the bulk of Omaha & Grant's production appears to have been in lead smelting (Refs. 17, pp. 142-148, 154-155; 19, pp. 2, 3). In all smelting processes, it is not possible to completely separate the desired metal from the dross, and a portion is lost in the slag, in the flue dust, and some in the exhaust gases (Ref. 20, p. 92). Some of the major impurities in lead bullion are gold, silver, copper, arsenic and zinc (Ref. 20, p. 314). A wind rose of the study area shows winds come most often out of the west-southwest over Omaha & Grant, and into the Swansea and Elyria neighborhoods (Ref. 22, Figure 6).

Two additional smelting and refining operations were located in this area of North Denver; the Argo Smelter, and the Globe Smelter, located to the west and north west respectively, where operations similar to those of the Omaha & Grant took place (Refs. 5, figure 1; 17, pp. 136-142, 148-154). In addition, this area has become quite industrial and is located at the intersection of two major highways (Ref. 14). Statistically determined background samples are considered to be reflective of the immediate study area yet outside the influence of the smelters due to the number of samples collected in the study area as well as in the metro Denver area (Ref. 9 pp. 6-2 through 6-6). These factors could have contributed to contamination present in the Swansea and Elyria neighborhoods.

The Colorado Department of Public Health and Environment (CDPHE) collected twenty-five soil samples from residential yards in North Denver on July 16, 1997. Samples were collected from residential yards located immediately north of the elevated portion of Interstate 70 in the Swansea and Elyria neighborhoods of Denver, Colorado. More specifically, the samples were collected from the 4600 and 4700 blocks of Williams Street, Race Street, and Vine Street; the 4600 block of Franklin Street and Baldwin Court; the 4700 block of Fillmore Street and Gaylord Street; and the 4800 block of St. Paul Street (Ref. 5, Table 4).

These 25 soil samples indicated levels of arsenic ranging from 754 parts per million (ppm) to 3.8 ppm, cadmium ranging from 8 ppm to 2 ppm, and lead ranging from 523 ppm to 58 ppm (Ref. 5, Table 1). The discovery of these concentrations prompted the need to further investigate the extent of arsenic, cadmium, and lead present in soils in this region of North Denver.

The additional investigation conducted by Region VIII U.S. Environmental Protection Agency (EPA) and their contractors included the collection of a total of 3,550 surface soil samples (collected from less than 2

feet below ground surface (bgs)) from parks, schools, and residences in the Elyria and Swansea neighborhoods (Ref. 3, Table 4; Ref. 13). Boundaries for this sampling effort were Colorado Boulevard on the east, the South Platte River on the west, East 38th Avenue on the south, and East 56th Avenue on the north (Ref. 3, Figure 1). Soil samples collected were analyzed for arsenic, cadmium, and lead by a TN Spectrace 9000® X-Ray Fluorescence Spectrometer (XRF) with approximately 10 percent of the samples submitted to a laboratory for confirmation analysis (Ref. 3, p. 10).

Laboratory confirmation samples were sent to three different laboratories for analysis using Inductively Coupled Plasma emission spectroscopy (ICP) SW-846 Method 6010. Confirmation samples were chosen based on two criteria. The majority of samples analyzed with the XRF found to be above either the arsenic analytical target level of 70 milligrams per kilogram (mg/kg), or the lead analytical target level of 500 mg/kg were sent for laboratory confirmation. If two samples were collected from a property and both had XRF results above an arsenic or lead analytical target level, in some instances, only one of the samples was sent to the laboratory for confirmation analysis (Ref. 3, pp. 4-5). Although cadmium was also detected at elevated levels in the study area, for purposes of simplicity only arsenic and lead will be evaluated in this HRS package

The results of the laboratory confirmation samples were utilized to delineate an area of approximately 456 acres of surficial soil arsenic and lead contamination (Ref. 4).

Location of the source, with reference to a map of the site: The area of contaminated soils lies in an area bounded on the west by the South Platte River, the North by East 56th Avenue, the East by Colorado Boulevard, and the South by East 38th Avenue (Reference 3, Figure 1; Ref. 4; Ref. 14).

Containment

Gas release to air
Air Pathway not scored.

Particulate release to air
Air Pathway not scored.

Release to ground water
Groundwater Pathway not scored.

Release via overland migration and/or flood
Surface Water Pathway not scored.

The documented presence of elevated arsenic and lead concentrations in the surficial soils in and around Vasquez Boulevard and I-70 study area delineates an area of observed soil contamination as defined by section 5.0.1 of Reference 1. The containment factor values are not applicable to the soil exposure pathway.

2.4.1 Hazardous Substances

Hazardous Substance	Evidence		References
	Station Location No.	Laboratory Sample ID No.	
Arsenic	D4690CYF10	9805025-94	Ref. 3, Table 5 Ref. 6, p. 207
Lead	D4419JOB16	9806050-11	Ref. 3, Table 5 Ref. 6, p. 453

The soil samples listed above were collected during the July 1998 Vasquez and I-70 sampling effort conducted by UOS and REAC. Samples collected during this effort were analyzed by three separate laboratories: Roy F. Weston laboratories in Edison, New Jersey; Analytica Laboratories, Broomfield, Colorado; and Paragon Analytics, Fort Collins, Colorado. All samples were analyzed using ICP SW-486 Method 1610. Analytical results from soil samples submitted to three separate laboratories indicate the presence of arsenic concentrations in surface soils (0 to 2 feet bgs) ranging from 84.3 mg/kg (lowest concentration for establishing significance above background) to a maximum of 2,810 mg/kg, and lead concentrations up to 5570 mg/kg (Ref. 3, Table 5). This area of contamination is delineated based on a comparison of confirmation sample results to the background arsenic level of 28.1 mg/kg and background lead concentration of 413 mg/kg established during the ASARCO Inc. smelter site residential soil investigation (Refs. 3; 4; 7; 8, Appendix 9E, p. 7; 9, pp. 6-16 through 6-23).

All sampling station locations were located with a Trimble® GPS system. Final GPS coordinates were provided by ISSI and are displayed on Reference 4. These coordinates, in conjunction with the laboratory analytical data, were utilized to derive the area of contaminated soil as shown on Reference 4.

2.4.2. Hazardous Waste Quantity

2.4.2.1.1. Hazardous Constituent Quantity

Hazardous Substance	Constituent Quantity (pounds) (Mass - S)	Reference

There are no hazardous Constituent Quantity data available for the area of contaminated soil to derive a hazardous constituent quantity value.

sum: (pounds)

Hazardous Constituent Quantity Value (S):

2.4.2.1.2. Hazardous Waste stream Quantity

Hazardous Waste stream	Quantity (pounds)	Reference

Data are not complete; therefore, it is not possible to adequately determine the Hazardous Waste stream Quantity.

sum: (pounds)

Hazardous Waste stream Quantity Value (W):

2.4.2.1.3. Volume

Data are not complete; therefore, it is not possible to adequately determine the volume of the contaminated soil area.

Dimension of source (yd^3 or gallons):

References(s):

Volume Assigned Value:

2.4.2.1.4. Area

Surface soil samples (collected less than 2 feet bgs) submitted to three separate laboratories indicate the presence of arsenic and lead in levels exhibiting significance above background as defined in the HRS Table 2-3. The area of surface soil contamination as delineated by a comparison of these samples to background levels established during the ASARCO Globe Plant Remedial Investigation (Refs. 7; 8, Appendix 9E, p. 7; 9, pp. 6-16 through 6-23) covers an expanse of 24,842,936 square feet (Ref. 4); however, to account for the paved areas not subject to consideration as contaminated soil, UOS estimated the amount of paved surface within the study area at approximately 4,968,592 square feet (Ref. 12, pp. 10-14). The paved area was estimated by measuring the average width of residential and main thoroughfare streets crossing the study area. The widths were then multiplied by the length of each street as measured from Reference 4 to derive a paved area estimate for the Vasquez Boulevard and I-70 study area.

UOS subtracted the estimated paved area (4,968,592 square feet) from the total 24,842,936 square feet to arrive at a final area of contaminated soil of 19,874,344 square feet.

By following the stated procedure outlined Section 2.4.2 and Table 5-2 of the HRS (Ref. 1), UOS determined the assigned area value as follows:
19,874,344/34,000 = 584.54

Area of source (ft^2): 19,874,344
Reference(s): 3,4,6

Area Assigned Value: 584.54

2.4.2.1.5. Source Hazardous Waste Quantity Value

Source Hazardous Waste Quantity Value: 584.54

UOS determined the hazardous waste quantity as follows: 19,874,344 square feet of arsenic and lead contaminated soil is delineated by approximately 368 separate confirmation soil samples (Refs. 3, Table 5; 4). Per Reference 1, Table 5-2, UOS divided 19,874,344 by 34,000 to derive the hazardous waste quantity factor value of 584.54. Since the hazardous waste quantity factor value is greater than 100 and less than 10,000 the assigned value is 100 (Ref. 1, Table 2-6).

Tier Evaluated	Source Values
A	NS
B	NS
C	NS
D	584.54

NS - Not Scored
The value selected for the hazardous waste quantity according to the HRS Final Rule is 100.

2.4.2.2. Hazardous Waste Quantity Factor Value

According to Table 2-6 in the HRS Final Rule, and based on a source hazardous waste quantity value of 584.54, the hazardous waste quantity factor value is 100 (Ref. 1, Table 2-6, p.51591).

Source Hazardous Waste Quantity Factor Value: 100

SITE SUMMARY OF SOURCE DESCRIPTIONS

Source No.	Source Hazardous Waste Quantity Factor Value	Containment			
		Groundwater	Surface Water	Gas	Air Particulate
1	100	NS	NS	NS	NS

5.0 SOIL EXPOSURE PATHWAY

5.0.1 GENERAL CONSIDERATIONS

Letter (A, B, etc.) by which this area is to be identified: A

Name and description of the area: Arsenic and Lead Contaminated Soils

Location of the area, with reference to a map of the site: Area of contaminated soils lies in an area bounded on the west by the South Platte River, the North by East 56th Avenue, the East by Colorado Boulevard, and the South by East 38th Avenue (Refs. 3, Figure 1; 4; 14).

- Background Concentration

In 1987, TRC, in conjunction with the Colorado Department of Public Health and Environment (formerly the Colorado Department of Health) collected samples E2-3A and E2-3B from location E2-3, immediately north of the Riverside Cemetery (Ref. 3, Figure 1). These samples were collected as part of the remedial investigation for the ASARCO Globe Plant Site (Refs. 8, 9). Soil sample location E2-3 is considered to be representative of background conditions due to its location outside of the apparent area of contaminant deposition, and its proximity to the I-70 and Vasquez site. The arsenic level in sample E2-3B was reported at 18 mg/kg (Ref. 8, Appendix 9E, p. 7). The arsenic level in sample E2-3A was reported at 23 mg/kg (Ref. 8, Appendix 9E, p. 7). The arsenic concentrations in E2-3 closely match arsenic background conditions statistically identified in the Remedial Investigation Report to be 28.1 parts per million (ppm) as calculated in log histograms of 378 samples (Ref. 9, pp. 6-16 thru 6-21). These samples were collected according to protocols approved by the State and were analyzed using EPA Method 206.1 and 206.2 (Ref. 9, pp. 6-6 thru 6-9). Further, Shacklette (1984) has shown arsenic concentrations in the Colorado Front Range area to be lower than those used in this package (Ref. 7, p. 18). As such, the background concentration used for scoring purposes will be the highest of these values, 28.1 ppm.

Lead results used for this same remedial investigation, plotted in a log histogram, did not show two clearly distinct populations. The mean lead level for all samples collected outside the Globe plant immediate area was 204 ppm with a standard deviation of 209 ppm; the mean plus one standard deviation being equal to 413 ppm (Ref. 9, p. 6-21). To be conservative, this value was used as the background level of lead for this package. The table on the following page summarizes this data.

Two additional smelting and refining operations were located in this area of North Denver; the Argo Smelter, and the Globe Smelter, located to the west and north west respectively, where operations similar to those of the Omaha & Grant took place (Refs. 5, figure 6A; 17, pp. 136-142, 148-154). In addition, this area has become quite industrial and is located at the intersection of two major highways (Ref. 14). Statistically determined background samples are considered to be reflective of the immediate study area yet outside the influence of the smelters due to the number of samples collected in the study area as well as in the metro Denver area (Ref. 9, pp. 6-2 through 6-6). These factors could have contributed to contamination present in the Swansea and Elyria neighborhoods.

Sample ID	Hazardous Substance	Concentration	Sample Quantitation Limit	Reference
Local mean conc.	Arsenic	4.1 ppm	N/A	Ref. 7, p. 18
E2-3B	Arsenic	18 ppm	0.5 ppm	Ref. 8, App. 9E p. 7 Ref 9, pp. 6-8
E2-3A	Arsenic	23 ppm	0.5 ppm	Ref. 8, App. 9E p. 7 Ref 9, pp. 6-8
Local His. bkgrnd.	Arsenic	28.1 ppm	N/A	Ref 9, pp. 6-16 -21
Local His. bkgrnd.	Lead	413 ppm	N/A	Ref 9, pp. 6-21 -23

- Level I Contaminated Samples

Sample ID	Depth	Date	Reference
D3835ADF10	< 2 feet	April 23, 1998	3, Table 5; 13, p. 1; 6, p.296
D4831ADF10	< 2 feet	April 22, 1998	3, Table 5; 13, p. 3; 6, p.345
D4850ADF10	< 2 feet	April 22, 1998	3, Table 5; 13, p. 5; 6, p.349
D4935ADF10	< 2 feet	April 22, 1998	3, Table 5; 13, p. 7; 6, p.351
D4959ADF10	< 2 feet	April 22, 1998	3, Table 5; 13, p. 9; 6, p.352
D5020ADB16	< 2 feet	April 23, 1998	3, Table 5; 13, p. 11; 6, p.384
D5030ADF10	< 2 feet	April 23, 1998	3, Table 5; 13, p. 13; 6, p.385
D5067ADF10	< 2 feet	April 23, 1998	3, Table 5; 13, p. 15; 6, p.386
D4535CBF10	< 2 feet	April 18, 1998	3, Table 5; 13, p. 17; 6, p.102
D4539CBF10	< 2 feet	April 18, 1998	3, Table 5; 13, p. 19; 6, p.103
D4679CBB10	< 2 feet	April 15, 1998	3, Table 5; 13, p. 21; 6, p.203
D4715CBF10	< 2 feet	April 15, 1998	3, Table 5; 13, p. 23; 6, p.192
D4770CBF16	< 2 feet	April 28, 1998	3, Table 5; 13, p. 27; 6, p.313
D4060CKB16	< 2 feet	April 23, 1998	3, Table 5; 13, p. 29; 6, p.298
D4785CLF10	< 2 feet	April 14, 1998	3, Table 5; 13, p. 31; 6, p.65
D4325CYF10	< 2 feet	April 20, 1998	3, Table 5; 13, p. 33; 6, p.268
D4328CYF10	< 2 feet	April 20, 1998	3, Table 5; 13, p. 35; 6, p.271
D4343CYF10	< 2 feet	April 20, 1998	3, Table 5; 13, p. 37; 6, p.270
D4375CYS10	< 2 feet	April 20, 1998	3, Table 5; 13, p. 39; 6, p.269

- Level I Contaminated Samples

Sample ID	Depth	Date	Reference
D4641CYF10	< 2 feet	April 17, 1998	3, Table 5; 13, p. 41; 6, p.107
D4651CYB10	< 2 feet	April 17, 1998	3, Table 5; 13, p. 43; 6, p.109
D4690CYF10	< 2 feet	April 17, 1998	3, Table 5; 13, p. 45; 6, p.207
D4700CYB10	< 2 feet	April 17, 1998	3, Table 5; 13, p. 47; 6, p.208
D4705CYF10	< 2 feet	April 17, 1998	3, Table 5; 13, p. 59; 6, p.210
D4725CYF10	< 2 feet	April 17, 1998	3, Table 5; 13, p. 61; 6, p.111
D4746CYF10	< 2 feet	April 17, 1998	3, Table 5; 13, p. 49; 6, p.112
D4780CYB10	< 2 feet	April 17, 1998	3, Table 5; 13, p. 51; 6, p.113
D4809CYF10	< 2 feet	April 21, 1998	3, Table 5; 13, p. 53; 6, p.167
D4811CYB10	< 2 feet	April 21, 1998	3, Table 5; 13, p. 55; 6, p.168
D4850CYF10	< 2 feet	April 21, 1998	3, Table 5; 13, p. 57; 6, p.243
D4050FIB10	< 2 feet	April 14, 1998	3, Table 5; 13, p. 63; 6, p.63
D4319FIF10	< 2 feet	April 21, 1998	3, Table 5; 13, p. 65; 6, p.327
D4325FIF10	< 2 feet	April 21, 1998	3, Table 5; 13, p. 67; 6, p. 326
D4442FIF10	< 2 feet	April 21, 1998	3, Table 5; 13, p. 71; 6, p.322
D4635FIF10	< 2 feet	April 17, 1998	3, Table 5; 13, p. 73; 6, p.120
D4640FIF10	< 2 feet	April 17, 1998	3, Table 5; 13, p. 75; 6, p.121
D4650FIF10	< 2 feet	April 17, 1998	3, Table 5; 13, p. 77; 6, p.122
D4705FIF10	< 2 feet	April 25, 1998	3, Table 5; 13, p. 79; 6, p.315
D4775FIF10	< 2 feet	April 18, 1998	3, Table 5; 13, p. 81; 6, p.161
D4801FIB10	< 2 feet	April 21, 1998	3, Table 5; 13, p. 83; 6, p.247
D4815FIF10	< 2 feet	April 21, 1998	3, Table 5; 13, p. 85; 6, p.248
D4907FIF10	< 2 feet	April 21, 1998	3, Table 5; 13, p. 87; 6, p.250
D4923FIF10	< 2 feet	April 21, 1998	3, Table 5; 13, p. 89; 6, p.251
D4744GYF10	< 2 feet	April 15, 1998	3, Table 5; 13, p. 97; 6, p.196
D4653HIB10	< 2 feet	April 21, 1998	3, Table 5; 13, p. 101; 6, p.328
D4775HIB10	< 2 feet	April 21, 1998	3, Table 5; 13, p. 103; 6, p.330
D4783HIF10R	< 2 feet	April 21, 1998	3, Table 5; 13, p. 105; 6, p.331
D3906JAF10	< 2 feet	April 24, 1998	3, Table 5; 13, p. 107; 6, p.403
D3990JAB10	< 2 feet	April 24, 1998	3, Table 5; 13, p. 109; 6, p.404
D3808MAF10	< 2 feet	April 24, 1998	3, Table 5; 13, p. 111; 6, p.397
D3818MAF10	< 2 feet	April 24, 1998	3, Table 5; 13, p. 113; 6, p.398
D4109MIF10	< 2 feet	April 15, 1998	3, Table 5; 13, p. 115; 6, p.40
D4335MIF10	< 2 feet	April 20, 1998	3, Table 5; 13, p. 117; 6, p.319

- Level I Contaminated Samples

Sample ID	Depth	Date	Reference
D4680MIF10	< 2 feet	April 20, 1998	3, Table 5; 13, p. 119; 6, p.140
D4695MIB10	< 2 feet	April 20, 1998	3, Table 5; 13, p. 121; 6, p.141
D4755MIF10	< 2 feet	April 20, 1998	3, Table 5; 13, p. 123; 6, p.143
D4801MIF10	< 2 feet	April 22, 1998	3, Table 5; 13, p. 125; 6, p.254
D4809MIF10	< 2 feet	April 22, 1998	3, Table 5; 13, p. 127; 6, p.255
D4912MIB10	< 2 feet	April 22, 1998	3, Table 5; 13, p. 129; 6, p.259
D4920MIF10	< 2 feet	April 22, 1998	3, Table 5; 13, p. 131; 6, p.260
D4924MIB10	< 2 feet	April 22, 1998	3, Table 5; 13, p. 133; 6, p.263
D4669RAB10	< 2 feet	April 17, 1998	3, Table 5; 13, p. 135; 6, p.316
D4736RAF10	< 2 feet	April 22, 1998	3, Table 5; 13, p. 137; 6, p.213
D4715SCB10	< 2 feet	April 20, 1998	3, Table 5; 13, p. 139; 6, p.163
D4760SCB16	< 2 feet	April 20, 1998	3, Table 5; 13, p. 141; 6, p.166
D4770SCB16	< 2 feet	April 20, 1998	3, Table 5; 13, p. 143; 6, p.165
D4334SSB10	< 2 feet	April 18, 1998	3, Table 5; 13, p. 145; 6, p.147
D4430SSF10	< 2 feet	April 17, 1998	3, Table 5; 13, p. 147; 6, p.151
D4914SSF10	< 2 feet	April 23, 1998	3, Table 5; 13, p. 149; 6, p.434
D4935SSF10	< 2 feet	April 23, 1998	3, Table 5; 13, p. 151; 6, p.435
D5063SSB16	< 2 feet	April 23, 1998	3, Table 5; 13, p. 153; 6, p.438
D5170SSB10	< 2 feet	April 23, 1998	3, Table 5; 13, p. 157; 6, p.412
D4145STF10	< 2 feet	April 15, 1998	3, Table 5; 13, p. 161; 6, p.201
D4315STB16	< 2 feet	April 18, 1998	3, Table 5; 13, p. 163; 6, p.155
D4940STF10	< 2 feet	April 23, 1998	3, Table 5; 13, p. 165; 6, p.389
D4980STF10	< 2 feet	April 23, 1998	3, Table 5; 13, p. 167; 6, p.392
D4435THB16	< 2 feet	April 20, 1998	3, Table 5; 13, p. 169; 6, p.158
D4459THB10	< 2 feet	April 20, 1998	3, Table 5; 13, p. 171; 6, p.159
D4545THF10	< 2 feet	April 21, 1998	3, Table 5; 13, p. 173; 6, p.407
D4625THF20	< 2 feet	April 24, 1998	3, Table 5; 13, p. 177; 6, p.408
D4711THB10	< 2 feet	April 16, 1998	3, Table 5; 13, p. 179; 6, p.211
D4720THF10R	< 2 feet	April 16, 1998	3, Table 5; 13, p. 181; 6, p.212
D4691VIB16	< 2 feet	April 16, 1998	3, Table 5; 13, p. 187; 6, p.225
D4771VIF10	< 2 feet	April 17, 1998	3, Table 5; 13, p. 189; 6, p.216
D4773VIF10	< 2 feet	April 17, 1998	3, Table 5; 13, p. 191; 6, p.217
D4659WIF10	< 2 feet	April 22, 1998	3, Table 5; 13, p. 193; 6, p.334
D4720WIB10	< 2 feet	April 22, 1998	3, Table 5; 13, p. 195; 6, p.336

- Level I Contaminated Samples

Sample ID	Depth	Date	Reference
D4727WIB16	< 2 feet	April 22, 1998	3, Table 5; 13, p. 197; 6, p.339
D3742DEB10	< 2 feet	April 21, 1998	3, Table 5; 13, p. 203; 6, p. 278
D3838STB10	< 2 feet	April 23, 1998	3, Table 5; 13, p. 205; 6, p. 290
D4044STF10	< 2 feet	April 23, 1998	3, Table 5; 13, p. 207; 6, p. 291
D4150ADF10	< 2 feet	April 23, 1998	3, Table 5; 13, p. 209; 6, p. 292
D4336STF10	< 2 feet	April 22, 1998	3, Table 5; 13, p. 211; 6, p. 285
D4512CYS10	< 2 feet	April 20, 1998	3, Table 5; 13, p. 213; 6, p. 274
D4780CBB10	< 2 feet	April 15, 1998	3, Table 5; 13, p. 215; 6, p. 48

Sample ID	Hazardous Substance	Concentration (ppm) *	(Conv.)	Sample Quantitation Limit (ppm)†	Reference
D3835ADF10	Arsenic	400.0		6.0	3, Table 5; 13, p. 1; 6, p.296
D4831ADF10	Arsenic	118.0		6.0	3, Table 5; 13, p. 3; 6, p.345
D4850ADF10	Arsenic	1500.0		6.0	3, Table 5; 13, p. 5; 6, p.349
D4935ADF10	Arsenic	403.0		6.0	3, Table 5; 13, p. 7; 6, p.351
D4959ADF10	Arsenic	607.0		6.0	3, Table 5; 13, p. 9; 6, p.352
D5020ADB16	Arsenic	104.0		1.0	3, Table 5; 13, p. 11; 6, p.384
D5030ADF10	Arsenic	367.0		1.0	3, Table 5; 13, p. 13; 6, p.385
D5067ADF10	Arsenic	167.0		1.0	3, Table 5; 13, p. 15; 6, p.386
D4535CBF10	Arsenic	121.0		6.0	3, Table 5; 13, p. 17; 6, p.102
D4539CBF10	Arsenic	235.0		6.0	3, Table 5; 13, p. 19; 6, p.103
D4679CBB10	Arsenic	203.0		6.0	3, Table 5; 13, p. 21; 6, p.203
D4715CBF10	Arsenic	102.0		6.0	3, Table 5; 13, p. 23; 6, p.192
D4770CBF16	Arsenic	282.0		6.0	3, Table 5; 13, p. 27; 6, p.313
D4060CKB16	Arsenic	193.0		6.0	3, Table 5; 13, p. 29; 6, p.298
D4785CLF10	Arsenic	200.0		6.0	3, Table 5; 13, p. 31; 6, p.65
D4325CYF10	Arsenic	94.4		6.0	3, Table 5; 13, p. 33; 6, p.268
D4328CYF10	Arsenic	132.0		6.0	3, Table 5; 13, p. 35; 6, p.271
D4343CYF10	Arsenic	123.0		6.0	3, Table 5; 13, p. 37; 6, p.270
D4375CYS10	Arsenic	298.0		6.0	3, Table 5; 13, p. 39; 6, p.269
D4641CYF10	Arsenic	330.0		6.0	3, Table 5; 13, p. 41; 6, p.107
D4651CYB10	Arsenic	146.0		6.0	3, Table 5; 13, p. 43; 6, p.109
D4690CYF10	Arsenic	2810.0		6.0	3, Table 5; 13, p. 45; 6, p.207
D4700CYB10	Arsenic	118.0		6.0	3, Table 5; 13, p. 47; 6, p.208
D4705CYF10	Arsenic	140.0		6.0	3, Table 5; 13, p. 59; 6, p.210
D4725CYF10	Arsenic	139.0		6.0	3, Table 5; 13, p. 61; 6, p.111
D4746CYF10	Arsenic	129.0		6.0	3, Table 5; 13, p. 49; 6, p.112
D4780CYB10	Arsenic	96.4		6.0	3, Table 5; 13, p. 51; 6, p.113
D4809CYF10	Arsenic	539.0		6.0	3, Table 5; 13, p.53; 6, p.167
D4811CYB10	Arsenic	85.3		6.0	3, Table 5; 13, p. 55; 6, p.168
D4850CYF10	Arsenic	288.0		6.0	3, Table 5; 13, p. 57; 6, p.243
D4050FIB10	Arsenic	94.0		6.0	3, Table 5; 13, p. 63; 6, p.63
D4319FIF10	Arsenic	128.0		6.0	3, Table 5; 13, p. 65; 6, p.327
D4325FIF10	Arsenic	95.9		6.0	3, Table 5; 13, p. 67; 6, p.326

Sample ID	Hazardous Substance	Concentration (ppm) *	(Conv.)	Sample Quantitation Limit (ppm)†	Reference
D4442FIF10	Arsenic	109.0		6.0	3, Table 5; 13, p. 71; 6, p.322
D4635FIF10	Arsenic	89.1		6.0	3, Table 5; 13, p. 73; 6, p.120
D4640FIF10	Arsenic	176.0		6.0	3, Table 5; 13, p. 75; 6, p.121
D4650FIF10	Arsenic	109.0		6.0	3, Table 5; 13, p. 77; 6, p.122
D4705FIF10	Arsenic	145.0		6.0	3, Table 5; 13, p. 79; 6, p.315
D4775FIF10	Arsenic	146.0		6.0	3, Table 5; 13, p. 81; 6, p.161
D4801FIB10	Arsenic	98.0		6.0	3, Table 5; 13, p. 83; 6, p.247
D4815FIF10	Arsenic	150.0		6.0	3, Table 5; 13, p. 85; 6, p.248
D4907FIF10	Arsenic	273.0		6.0	3, Table 5; 13, p. 87; 6, p.250
D4923FIF10	Arsenic	124.0		6.0	3, Table 5; 13, p. 89; 6, p.251
D4744GYF10	Arsenic	93.8		6.0	3, Table 5; 13, p. 97; 6, p.196
D4653HIB10	Arsenic	85.2		6.0	3, Table 5; 13, p. 101; 6, p.328
D4775HIB10	Arsenic	237.0		6.0	3, Table 5; 13, p. 103; 6, p.330
D4783HIF10R	Arsenic	418.0		6.0	3, Table 5; 13, p. 105; 6, p.331
D3906JAF10	Arsenic	738.0		1.0	3, Table 5; 13, p. 107; 6, p.403
D3990JAB10	Arsenic	184.0		1.0	3, Table 5; 13, p. 109; 6, p.404
D3808MAF10	Arsenic	97.5		1.0	3, Table 5; 13, p. 111; 6, p.397
D3818MAF10	Arsenic	911.0		1.0	3, Table 5; 13, p. 113; 6, p.398
D4109MIF10	Arsenic	1200.0		6.0	3, Table 5; 13, p. 115; 6, p.40
D4335MIF10	Arsenic	84.9		6.0	3, Table 5; 13, p. 117; 6, p.319
D4680MIF10	Arsenic	143.0		6.0	3, Table 5; 13, p. 119; 6, p.140
D4695MIB10	Arsenic	150.0		6.0	3, Table 5; 13, p. 121; 6, p.141
D4755MIF10	Arsenic	305.0		6.0	3, Table 5; 13, p. 123; 6, p.143
D4801MIF10	Arsenic	217.0		6.0	3, Table 5; 13, p. 125; 6, p.254
D4809MIF10	Arsenic	173.0		6.0	3, Table 5; 13, p. 127; 6, p.255
D4912MIB10	Arsenic	302.0		6.0	3, Table 5; 13, p. 129; 6, p.259
D4920MIF10	Arsenic	267.0		6.0	3, Table 5; 13, p. 131; 6, p.260
D4924MIB10	Arsenic	89.3		6.0	3, Table 5; 13, p. 133; 6, p.263
D4669RAB10	Arsenic	93.6		6.0	3, Table 5; 13, p. 135; 6, p.316
D4736RAF10	Arsenic	200.0		6.0	3, Table 5; 13, p. 137; 6, p.213
D4715SCB10	Arsenic	312.0		6.0	3, Table 5; 13, p. 139; 6, p.163
D4760SCB16	Arsenic	593.0		6.0	3, Table 5; 13, p. 141; 6, p.166
D4770SCB16	Arsenic	744.0		6.0	3, Table 5; 13, p. 143; 6, p.165

Sample ID	Hazardous Substance	Concentration (ppm)		Sample Quantitation Limit (ppm)†	Reference
		*	(Conv.)		
D4334SSB10	Arsenic	369.0		6.0	3, Table 5; 13, p. 145; 6, p.147
D4430SSF10	Arsenic	143.0		6.0	3, Table 5; 13, p. 147; 6, p.151
D4914SSF10	Arsenic	133.0		1.0	3, Table 5; 13, p. 149; 6, p.434
D4935SSF10	Arsenic	114.0		1.0	3, Table 5; 13, p. 151; 6, p.435
D5063SSB16	Arsenic	168.0		1.0	3, Table 5; 13, p. 153; 6, p.438
D5170SSB10	Arsenic	93.3		1.0	3, Table 5; 13, p. 157; 6, p.412
D4145STF10	Arsenic	193.0		6.0	3, Table 5; 13, p. 161; 6, p.201
D4315STB16	Arsenic	85.9		6.0	3, Table 5; 13, p. 163; 6, p.155
D4940STF10	Arsenic	619.0		1.0	3, Table 5; 13, p. 165; 6, p.389
D4980STF10	Arsenic	752.0		1.0	3, Table 5; 13, p. 167; 6, p.392
D4435THB16	Arsenic	296.0		6.0	3, Table 5; 13, p. 169; 6, p.158
D4459THB10	Arsenic	332.0		6.0	3, Table 5; 13, p. 171; 6, p.159
D4545THF10	Arsenic	125.0		1.0	3, Table 5; 13, p. 173; 6, p.407
D4625THF20	Arsenic	311.0		1.0	3, Table 5; 13, p. 177; 6, p.408
D4711THB10	Arsenic	1100.0		6.0	3, Table 5; 13, p. 179; 6, p.211
D4720THF10R	Arsenic	109.0		6.0	3, Table 5; 13, p. 181; 6, p.212
D4691VIB16	Arsenic	1830.0		6.0	3, Table 5;13 , p. 187; 6, p.225
D4771VIF10	Arsenic	697.0		6.0	3, Table 5; 13, p. 189; 6, p.216
D4773VIF10	Arsenic	203.0		6.0	3, Table 5; 13, p. 191; 6, p.217
D4659WIF10	Arsenic	490.0		30.0	3, Table 5; 13, p. 193; 6, p.334
D4720WIB10	Arsenic	132.0		6.0	3, Table 5; 13, p. 195; 6, p.336
D4727WIB16	Arsenic	171.0		6.0	3, Table 5; 13, p. 197; 6, p.339
D3742DEB10	Arsenic	239 J	137	6.0	3, Table 5; 13, p. 203; 6, p. 278
D3838STB10	Arsenic	550 J	316	6.0	3, Table 5; 13, p. 205; 6, p. 290
D4044STF10	Arsenic	438 J	252	6.0	3, Table 5; 13, p. 207; 6, p. 291
D4150ADF10	Arsenic	221 J	127	6.0	3, Table 5; 13, p. 209; 6, p. 292
D4336STF10	Arsenic	757 J	435	6.0	3, Table 5; 13, p. 211; 6, p. 285
D4512CYS10	Arsenic	177 J	102	6.0	3, Table 5; 13, p. 213; 6, p. 274
D4780CBB10	Arsenic	300 J	172	6.0	3, Table 5; 13, p. 215; 6, p. 48

* J Values shown in the Contaminated Samples Tables have been converted using multipliers found in the EPA Quick Reference Fact Sheet "Using Qualified Data To Document An Observed Release" (Ref. 21).

† Sample Quantitation Limits are shown in Reference 11.

- Level II Contaminated Samples

Sample ID	Depth	Date	Reference
D3702DEB16	< 2 feet	April 21, 1998	3, Table 5; 13, p. 217; 6, p. 276
D3830FRF16	< 2 feet	April 15, 1998	3, Table 5; 13, p. 219; 6, p. 450
D3830WIF16	< 2 feet	April 16, 1998	3, Table 5; 13, p. 221; 6, p. 89
D3834FRF10	< 2 feet	April 15, 1998	3, Table 5; 13, p. 223; 6, p. 49
D3842GIF10	< 2 feet	April 16, 1998	3, Table 5; 13, p. 225; 6, p. 129
D3865MAF16	< 2 feet	April 24, 1998	3, Table 5; 13, p. 227; 6, p. 400
D4419JOB16	< 2 feet	April 17, 1998	3, Table 5; 13, p. 229; 6, p. 453
D4632FRS20	< 2 feet	April 24, 1998	3, Table 5; 13, p. 231; 6, p. 304
D4669CBF10	< 2 feet	April 22, 1998	3, Table 5; 13, p. 233; 6, p. 104
D4709RAB10	< 2 feet	April 16, 1998	3, Table 5; 13, p. 235; 6, p. 191
D4768HIB16	< 2 feet	April 16, 1998	3, Table 5; 13, p. 237; 6, p. 215
D4792HIF10	< 2 feet	April 21, 1998	3, Table 5; 13, p. 239; 6, p. 332
D4795GYB16	< 2 feet	April 15, 1998	3, Table 5; 13, p. 241; 6, p. 66
D4794CLF10	< 2 feet	April 22, 1998	3, Table 5; 13, p. 243; 6, p. 42

Sample ID	Hazardous Substance	Concentration (ppm)		Sample Quantitation Limit (ppm)†	Reference
		*	(Conv.)		
D3702DEB16	Lead	6010 J	4174	6.0	3, Table 5; 13, p. 217; 6, p. 276
D3830FRF16	Lead	1620.0		6.0	3, Table 5; 13, p. 219; 6, p. 450
D3830WIF10	Lead	2240 J	1556	6.0	3, Table 5; 13, p. 221; 6, p. 89
D3834FRF10	Lead	2800 J	1944	6.0	3, Table 5; 13, p. 223; 6, p. 49
D3842GIF10	Lead	1760.0		6.0	3, Table 5; 13, p. 225; 6, p. 129
D3865MAF16	Lead	1550.0		1.0	3, Table 5; 13, p. 227; 6, p. 400
D4419JOB16	Lead	5570.0		1.0	3, Table 5; 13, p. 229; 6, p. 453
D4632FRS20	Lead	1650.0		1.0	3, Table 5; 13, p. 231; 6, p. 304
D4669CBF10	Lead	3920.0		6.0	3, Table 5; 13, p. 233; 6, p. 104
D4709RAB10	Lead	3280 J	2278	6.0	3, Table 5; 13, p. 235; 6, p. 191
D4768HIB16	Lead	1700.0		6.0	3, Table 5; 13, p. 237; 6, p. 215
D4792HIF10	Lead	2770.0		6.0	3, Table 5; 13, p. 239; 6, p. 332
D4794CLF10	Lead	1900 J	1319	6.0	3, Table 5; 13, p. 241; 6, p. 42
D4795GYB16	Lead	2400.0		6.0	3, Table 5; 13, p. 243; 6, p. 66

* J Values shown in the Contaminated Samples Tables have been converted using multipliers found in the EPA Quick Reference Fact Sheet "Using Qualified Data To Document An Observed Release" (Ref. 21).

† Sample Quantitation Limits are shown in Reference 11.

Attribution:

A comparison of soil samples to background samples collected during the 1988 ASARCO Globe Plant investigation resulted in the delineation of an area of arsenic and lead contaminated soils encompassing an estimated 19,874,344 square feet after subtracting the paved area found within the source (Refs. 3; 4; 5). The area of contaminated soils was delineated by comparing the site soil samples to the statistically determined background arsenic concentration of 28.1 mg/kg and lead log histogram derived background of 413 mg/kg (Ref. 8, p. 6-16 through 6-23). Sample location street addresses may be found using the Sample ID number and Reference 16, Vasquez Boulevard/I-70 Site Soil Sample Identification.

Three major smelters have operated in the North Denver area over the years: Asarco or Globe, the Argo, and the Omaha & Grant. Of these, the Omaha & Grant smelter was the nearest, located immediately to the west of the study area (Ref. 5, pp. 2-3, Figure 1). Construction on the Grant smelter was begun July 1882 and by November of that year was in full production on 50 acres east of the South Platte River and south of the present Denver Coliseum (Ref. 5, pp. 2-3, Figure 1; 17, pp. 142-148, 154-155; 18, p.38). At the time of its building, the Omaha & Grant Smelter was considered "...the largest and one of the most complete establishments for the treatment of ores in the world." (Ref. 18, p.38). Omaha & Grant used a 352 foot high stack, the tallest in the United States at the time, with nine water jacket blast furnaces below to handle a daily capacity of up to 300 tons of ore (Refs. 18, p.38; 19, p. 1). From its opening in 1882 until the smelter closed in 1902, ores were smelted or refined onsite to extract copper, gold, lead, silver and zinc, although the bulk of Omaha & Grant's production appears to have been in lead smelting (Refs. 17, pp. 142-148, 154-155; 19, pp. 2, 3). In all smelting processes, it is not possible to completely separate the desired metal from the dross, and a portion is lost in the slag, in the flue dust, and some in the exhaust gases (Ref. 20, p. 92). Some of the major impurities in lead bullion are gold, silver, copper, arsenic and zinc (Ref. 20, p. 314). A wind rose of the study area shows winds come most often out of the west-southwest over Omaha & Grant, and into the Swansea and Elyria neighborhoods (Ref. 22, Figure 6).

Two additional smelting and refining operations were located in this area of North Denver; the Argo Smelter, and the Globe Smelter, located to the west and north west respectively where operations similar to those of the Omaha & Grant took place (Refs. 5, figure 1; 17, pp. 136-142, 148-154). In addition, this area has become quite industrial and is located at the intersection of two major highways (Ref. 14). These factors could have contributed to contamination present in the Swansea and Elyria neighborhoods.

Area Hazardous Waste Quantity

Hazardous Constituent Quantity

Hazardous Substance	Constituent Quantity (pounds) (Mass-S)	Reference

Sum:

Hazardous Constituent Quantity Value (S):

Are the data complete for hazardous constituent quantity for this area? **No**.

Hazardous Wastestream Quantity

Hazardous Wastestream	Quantity (pounds)	References

NOT EVALUATED

Sum:

Hazardous Wastestream Quantity Value (W)

Are the data complete for hazardous wastestream quantity for this area? **No**.

Volume

NOT EVALUATED

Dimension of source (yd^3 or gallons):

References(s):

Volume Assigned Value:

Area

Area of area of observed contamination (ft^2): 19,874,344

Reference(s): 3,4,6,9

Area Assigned Value: 100

Area Hazardous Waste Quantity Value

The total area of observed soil contamination encompasses an expanse of 24,842,936 square feet (Ref. 3, Table 5; Ref. 4); however, of this area an estimated 4,968,592 square feet is paved. Per table 5-2 of the HRS (Ref. 1) the hazardous waste quantity is determined as follows: 24,842,936 square feet - 4,968,592 square feet = 19,874,344/34,000 = 584.54. Since the hazardous waste quantity lies between 100 and 10,000 then the assigned hazardous waste quantity factor value, per HRS Table 2-6, is 100.

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Area of Observed Contamination Hazardous Waste Quantity Value: 100

Summary of Site Contamination

Level I Samples

Sample ID: Refer to Section 5.0.1 of this HRS Documentation Record for Specific sample identification numbers.

Reference for Benchmarks: Reference 2

Hazardous Substance	Hazardous Substance Concentration	Benchmark Concentration	Benchmark
Arsenic	84.3-2810 mg/kg	0.43 mg/kg	CRSC (Ref. 2, p. B-65)
Lead		none for SE route	N/A

Level II Samples

Level II may be inferred in area between samples exhibiting Level I contamination as well as at all observed release samples for lead (Ref. 1, Section 2.5.1, p. 51593 and Section 5.1.3, p. 51647).

Sample ID	Hazardous Substance
Please refer to level I and II samples for the area of inferred soil contamination.	Lead and arsenic

5.1 RESIDENT POPULATION THREAT

Sample ID — Location of Population Relative to Observed Contamination

Hazardous Substance	Evidence		References
	Station Location No.	Laboratory Sample ID No.	
Lead	D4419JOB16	9806050-11	Refs. 3, Table 5; 13, p. 229; 6, p. 453
Arsenic	D4690CYF10	9805025-94	Refs. 3, Table 5; 13, p. 45; 6, p. 207

Sample location D4690CYF10 is on a resident individual's property and within 200 feet of the primary residence (Ref 13, p. 45). Analysis of this sample indicated an arsenic concentration of 2810 mg/kg in surface soils (collection depth < 2 feet bgs). From a total of 368 surface soil samples (all samples collected from < 2 feet bgs), more than 95 exhibited arsenic contamination at levels meeting the criteria for significance above background, and 14 met the requirements for significance above background regarding lead. All of the samples were collected from residential properties within 200 linear feet of the primary residence (Refs. 3, 4, 13).

5.1.1 Likelihood of Exposure

The presence of arsenic and or lead contamination in concentrations meeting observed contamination requirements on residential properties within 200 feet of the primary dwelling establishes a resident population threat for the site. Because no property was greater in length or width than 200 feet, all samples were within the target distance limit; in addition, fencing, localized topography, and landscaping and maintenance practices were used to confirm the property owner's statements regarding their property boundaries (Refs. 1, Section 5.1, p. 51646; 3; 4; 6; 8; 13; 16).

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Resident Population Threat Likelihood of Exposure Factor Category Value: 550

5.1.2 Waste Characteristics

5.1.2.1 Toxicity

Hazardous Substance	Toxicity Factor Value	Reference
Arsenic	10,000	Ref. 2, Page B-2
Lead	10,000	Ref. 2, Page B-13

Toxicity Factor Value: 10,000

5.1.2.2 Hazardous Waste Quantity

Area Letter	Area Hazardous Waste Quantity Value	Constituent Quantity Data Complete? (Yes/No)
A	100	N/A
	Sum of values: 100	

5.1.2.3 Calculation of Waste Characteristics Factor Category Value

10,000 X 100 = 1,000,000

Toxicity Factor Value x Hazardous Waste Quantity Factor Value: 1,000,000

The product of the toxicity factor value (10,000) and the hazardous waste quantity factor value (100) yields a waste characteristics product of 1,000,000. From Ref .1 , Table 2-7, this range results in an assigned waste characteristics factor category value of 32 for the I-70 and Vasquez area.

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Hazardous Waste Quantity Factor Value: 1,000,000
Waste Characteristics Factor Category Value: 32

5.1.3 TARGETS

5.1.3.1 Resident Individual

Area Letter: A
Level of Contamination: Level I

There are 95 residential soil samples that exhibit level I arsenic contamination within the I-70 and Vasquez study area. These samples delineate an area of observed soil contamination and document the presence of Level I soil contamination at each residence. These samples were all collected on the resident individual's property and within 200 linear feet of the residence; therefore, a resident individual factor of 50 is assigned (Ref. 1, Section 5.1.3.1, p. 51647).

Reference: 3; 4; 13; 16

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Resident Individual Factor Value: 50

5.1.3.2 Resident Population

5.1.3.2.1 Level I Concentrations

Area Letter	Resident Individuals (Residences	County Multiplier	Total)
A	95	2.17	206.15

Reference: 3, 4, 10

Sum of individuals subject to Level I concentrations: 206.15

Analysis from residential surface soil samples collected from the I-70 and Vasquez study area indicate the presence of arsenic exceeding the cancer risk screening concentration at 95 residences (Refs. 2, p. B-65; 3, Table 5). U.S. Department of Commerce, Bureau of Census data (Ref. 10, p. 43) indicates that there are an average of 2.17 individuals per residence in Denver County and 2.72 individuals per residence in Adams County. The Denver County multiplier was applied to all residences to generate a more conservative value. Based on these figures, UOS calculated a total of 206.15 individuals subject to Level I arsenic concentrations. Since these individuals are subject to level I contamination, the appropriate factor value is determined by summing the individuals subject to Level I contamination and multiplying by 10 (Ref. 1, Section 5.1.3.2.1, p. 51647) yielding a total factor value of 2062.

5.1.3.2.2 Level II Concentrations

Area Letter	Resident Individuals (Residences	County Multiplier	Total)
A	764	2.17	1657.88

Sum of individuals subject to Level II concentrations: 1657.88

There are an additional 14 residences exhibiting an observed release for lead but cannot be considered for Level I contamination as there is no benchmark available for lead for the Soil Exposure route. UOS conducted a house count from the available GIS map depicting the areal extent of soil contamination (Ref. 4). There are approximately 750 houses (excluding those already subject to Level I arsenic and Level II lead contamination) present within the area of observed soil contamination. These houses do not meet the criteria for evaluation subject to Level I contamination; however, their presence within the inferred area of soil contamination could indicate that they are subject to Level II concentrations (Ref. 1, Section 5.1, p. 51646). U.S. Department of Commerce, Bureau of Census data (Ref. 10, p. 43) indicates that there are an average of 2.17 individuals per residence in Denver County and 2.72 individuals per residence in Adams County. The Denver County multiplier was applied to all residences to generate a more conservative value.

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Level I Concentrations Factor Value: 2062
Level II Concentrations Factor Value: 1658

5.1.3.3 Workers

Area Letter	Number of Workers
A	Not Evaluated

Reference:

Total workers: 0

5.1.3.4 Resources

Resource Descriptor(s): There is no commercial agriculture, silviculture or commercial livestock production or grazing within the area of observed contamination.

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Workers Factor Value: 0
Resources Factor Value: 0

5.1.3.5 Terrestrial Sensitive Environments

Area Letter	Terrestrial Sensitive Environment	Value
A	None Documented	0

Likelihood of exposure factor category value (LE): 550
Waste characteristics factor category value (WC): 32
Terrestrial sensitive environments value (ES): 0
Product (LE x WC x ES): 0
(LE x WC x ES)/82,500: 0

Value of EC: 0

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Terrestrial Sensitive Environments Factor Value: 0

5.2 NEARBY POPULATION THREAT

5.2.1 Likelihood of Exposure

5.1.1.1 Attractiveness/Accessibility

Area Letter	Descriptor(s) for Area	Value
NEARBY POPULATION WAS CONSIDERED BUT NOT SCORED		0

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Attractiveness/Accessibility Factor Value: 0